10/766,854

Refine Search

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Terms	Documents
L9 and (irradiate or irradiating)	2

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IBM Technical Disclosure Bulletins

Search: L10

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Search History

DATE: Tuesday, September 21, 2004 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=USPT; PLUR=YES; OP=ADJ		
L10	L9 and (irradiate or irradiating)	2	L10
L9	L8 and plasma	15	L9
L8	L7 and temperature	21	L8
L7	L4 and (density)	21	L7
L6	L4 and (surface near2 density)	0	L6
L5	L4 and plasma and (irradiate or irradiating)	3	L5
L4	L2 and (silicon adj oxynitride)	25	L4
L3	L2 and (irradiating near3 plasma)	2	L3
L2	L1 and oxidizing and (nitrogen or n2 or ammonia or nh3 or n2h4) and (inert or argon or ar or he or helium or ne or neon or kr or krypton or xe or xenon)	63	L2
L1	nitriding near8 (insulator or insulating or dielectric)	219	L1

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Search Results - Record(s) 1 through 2 of 2 returned.

☐ 1. Document ID: US 6399520 B1

L10: Entry 1 of 2 File: USPT Jun 4, 2002

US-PAT-NO: 6399520
DOCUMENT-IDENTIFIER: US 6399520 B1
** See image for Certificate of Correction **

TITLE: Semiconductor manufacturing method and semiconductor manufacturing apparatus

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw. D

☐ 2. Document ID: US 6168980 B1

L10: Entry 2 of 2 File: USPT Jan 2, 2001

US-PAT-NO: 6168980
DOCUMENT-IDENTIFIER: US 6168980 B1

TITLE: Semiconductor device and method for forming the same

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw. D

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Terms	Documents
L9 and (irradiate or irradiating)	2

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L10: Entry 1 of 2 File: USPT Jun 4, 2002

DOCUMENT-IDENTIFIER: US 6399520 B1
**** See image for Certificate of Correction ****
TITLE: Semiconductor manufacturing method and semiconductor manufacturing apparatus

Abstract Text (1):
In an atmosphere of processing gas, on a wafer W consisting mainly of silicon, through a planar-array antenna RLSA 60 having a plurality of slits, microwaves are irradiated to generate plasma containing oxygen, or nitrogen, or oxygen and nitrogen and to implement therewith on the surface of the wafer W direct oxidizing, nitriding, or oxy-nitriding to deposit an insulator film 2 of a thickness of 1 nm or less in terms of oxide film. A manufacturing method and apparatus of semiconductors that can successfully regulate film quality of the interface between a silicon substrate and a SiN film and can form SiN film of high quality in a short time can be obtained.

Brief Summary Text (5):
Recently, as MIS (MOS) semiconductors have been patterned finer, extremely thin gate insulators such as approximately 4 nm or less are in demand. So far, for gate insulator material, silicon oxide films (SiO.sub.2 film) have been industrially used that can be obtained by directly oxidizing a silicon substrate by use of a high temperature furnace of approximately 850.degree. C. to 1000.degree. C.

Brief Summary Text (8):
When the SiN films are deposited by use of CVD method, there occur many incomplete bonds (dangling bond) at the interface with the silicon substrate to result in deterioration of device property. Accordingly, in forming the SiN films, it is considered very promising to directly nitride a silicon substrate by use of plasma. The reason why to nitride directly is to obtain gate insulators of high quality that are less in interface states.

Brief Summary Text (9):
In addition, one reason for using the plasma is to form SiN films at low temperatures. In obtaining SiN films by heating to nitride, high temperatures of 1000.degree. C. or more are necessary. In the process of the heating, dopant is injected into the silicon substrate. The dopant diffuses differentially to cause deterioration of device property. Such methods are disclosed in Japanese Patent Laid-open Application (KOKAI) Nos. SHO 55-134937 and SHO 59-4059.

Brief Summary Text (10):
However, in the case of depositing SiN layers with the plasma, the following problems have been pointed out. That is, ions in the plasma are accelerated by a plasma sheath voltage to bombard the silicon substrate with high energy, thereby so-called plasma damage occurs at interfaces of the silicon substrate or on the silicon substrate to deteriorate the device property.

Brief Summary Text (11):
To this end, a microwave plasma device is disclosed that is provided with a planar-array antenna that is low in electron temperature and has a lot of slits causing less plasma damage.

Brief Summary Text (13):
In this plasma device, the electron temperature is approximately 1 eV or less and the plasma sheath voltage also is several volts or less. Thus, compared with existing plasma of which plasma sheath voltage is approximately 50 V, the plasma damage can be largely reduced.

Brief Summary Text (14):
However, even when silicon nitride is formed with this plasma device, in the case of forming SiN films by use of direct nitriding method, there is the following problem. That is, in order to obtain interfaces of good quality of less dangling bond defects by dominantly distributing oxygen only at the interfaces of the silicon substrate, there is a difficulty in regulating film quality at the interfaces with the silicon substrate.

Brief Summary Text (15):
In addition, in employing this plasma device to nitride, nitrogen atoms must diffuse into the silicon substrate to proceed nitriding. That is a slow process to require a long time to give prescribed processing to an object being processed. Accordingly, the objects can not be processed much per unit period to cause difficulties in industrial application. In forming SiN films of a thickness of for instance 4 nm, even under the best adjusted plasma conditions of such as pressure and microwave power, it takes approximately 5 min or more to process. Accordingly, throughput is much lower than that required from a viewpoint of mass-production, for instance 1 min per one piece of the object.

Brief Summary Text (19):
To the above ends, a manufacturing method of semiconductors of the present invention is characterized in implementing the invention in the following manner. That is, in an atmosphere of processing gas, microwaves are irradiated through a planar-array antenna having a plurality of slits on an object to be processed comprising silicon to generate plasma containing oxygen, or nitrogen, or oxygen and nitrogen. With the plasma, direct oxidation, nitriding, or oxynitriding is implemented on a surface of the object to form an insulator film of a thickness of 1 nm or less (in terms of silicon oxide film).

Brief Summary Text (20):
In the present manufacturing method, a thickness of insulator film is 1 nm or less. Accordingly, the nitriding of the silicon substrate is not due to diffusion but due mainly to a reaction process between nitrogen atoms or oxygen atoms or nitrogen and oxygen atoms generated by the plasma and the surface of silicon substrate. As a result of this, a nitriding rate of such short as approximately 30 sec can be obtained.

Brief Summary Text (21):
On the thin insulator film that is obtained by implementing the direct nitriding or oxidizing or oxy-nitriding, the rest of the insulator film is deposited by use of CVD method. In this case, since a deposition rate of 3 nm/min or more can be attained relatively easily, even an insulator film of a total film thickness of 4 nm can be formed in less than two min.

Brief Summary Text (22):
In addition, in the present manufacturing method, a process for forming, due to direct nitriding or oxidizing or oxy-nitriding, an insulator film of good quality at an interface with the silicon substrate and a process for forming thereon, due to CVD method, the rest of the insulator film can be independently implemented. Accordingly, compared with the case where all process is implemented by direct nitriding only or CVD method only to form an insulator film, the film quality at the interface with the silicon substrate can be improved in regulation to result in an insulator film of better quality.

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☐ 1. Document ID: US 6399520 B1

L3: Entry 1 of 2 File: USPT Jun 4, 2002

US-PAT-NO: 6399520
DOCUMENT-IDENTIFIER: US 6399520 B1
** See image for Certificate of Correction **

TITLE: Semiconductor manufacturing method and semiconductor manufacturing apparatus

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

☐ 2. Document ID: US 6168980 B1

L3: Entry 2 of 2 File: USPT Jan 2, 2001

US-PAT-NO: 6168980
DOCUMENT-IDENTIFIER: US 6168980 B1

TITLE: Semiconductor device and method for forming the same

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

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Terms	Documents
L2 and (irradiating near3 plasma)	2

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Search Results - Record(s) 1 through 3 of 3 returned.

1. Document ID: US 6465290 B1

L5: Entry 1 of 3 File: USPT Oct 15, 2002

US-PAT-NO: 6465290
DOCUMENT-IDENTIFIER: US 6465290 B1

TITLE: Method of manufacturing a semiconductor device using a polymer film pattern

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

2. Document ID: US 6399520 B1

L5: Entry 2 of 3 File: USPT Jun 4, 2002

US-PAT-NO: 6399520
DOCUMENT-IDENTIFIER: US 6399520 B1
**** See image for Certificate of Correction ****

TITLE: Semiconductor manufacturing method and semiconductor manufacturing apparatus

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

3. Document ID: US 6168980 B1

L5: Entry 3 of 3 File: USPT Jan 2, 2001

US-PAT-NO: 6168980
DOCUMENT-IDENTIFIER: US 6168980 B1

TITLE: Semiconductor device and method for forming the same

Full | Title | Citation | Front | Review | Classification | Date | Reference | | | Claims | KWIC | Draw D

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Terms	Documents
L4 and plasma and (irradiate or irradiating)	3

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